

## Cattail/Kettle Lake

### Site Description

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#### **Location**

Water designation number (WDN)	48-0012-00
Legal description	T125N-R55W-Sec. 6,7,18,19 T125N-R56W-Sec. 1,2,10,11,12,13,14,23,24
County (ies)	Marshall
Location from nearest town	5.0 miles west and 3.0 miles north of Eden, SD

#### **Survey Dates and Sampling Information**

Survey dates	August 18-19, 2015 (GN) September 29, 2015 (EF-WAE)
Gill net sets (n)	6
Electrofishing-WAE (min)	60

#### **Morphometry (Figure 1)**

Watershed area (acres)	29,465
Surface area (acres)	3,017
Maximum depth (ft)	18
Mean depth (ft)	10

#### **Ownership and Public Access**

Cattail/Kettle Lake is a non-meandered lake; however, a significant amount of land previously managed as a Game Production Area (GPA) is now submerged. Water elevations have encroached on private lands creating private ownership of much of the lakeshore. Both private and public land can be found beneath the water. A public access site is located on the west shore of Cattail/Kettle Lake and is maintained by the SDGFP (Figure 1; Figure 2).

#### **Watershed and Land Use**

The 29,465 acre Cattail/Kettle Lakes sub-watershed (HUC-12) is located within the larger Northern Coteau Lakes-Upper James River (HUC-10) watershed. Land use within the watershed is primarily agricultural with a mix of pasture or grassland, cropland, and woodland.

#### **Water Level Observations**

Cattail/Kettle Lake has no established OHWM and an outlet elevation was not available. On April 28, 2015 the elevation of Cattail/Kettle Lake was 1791.3 fmsl; 0.1 ft below the fall 2014 elevation of 1791.4 fmsl. On October 19, 2015 the elevation was 1790.2 fmsl.

#### **Fish Management Information**

Primary species	walleye, yellow perch
Other species	black bullhead, black crappie, bluegill, common carp, largemouth bass, northern pike, smallmouth bass, white sucker
Lake-specific regulations	walleye: minimum length 15"
Management classification	warm-water marginal
Fish consumption advisories	none

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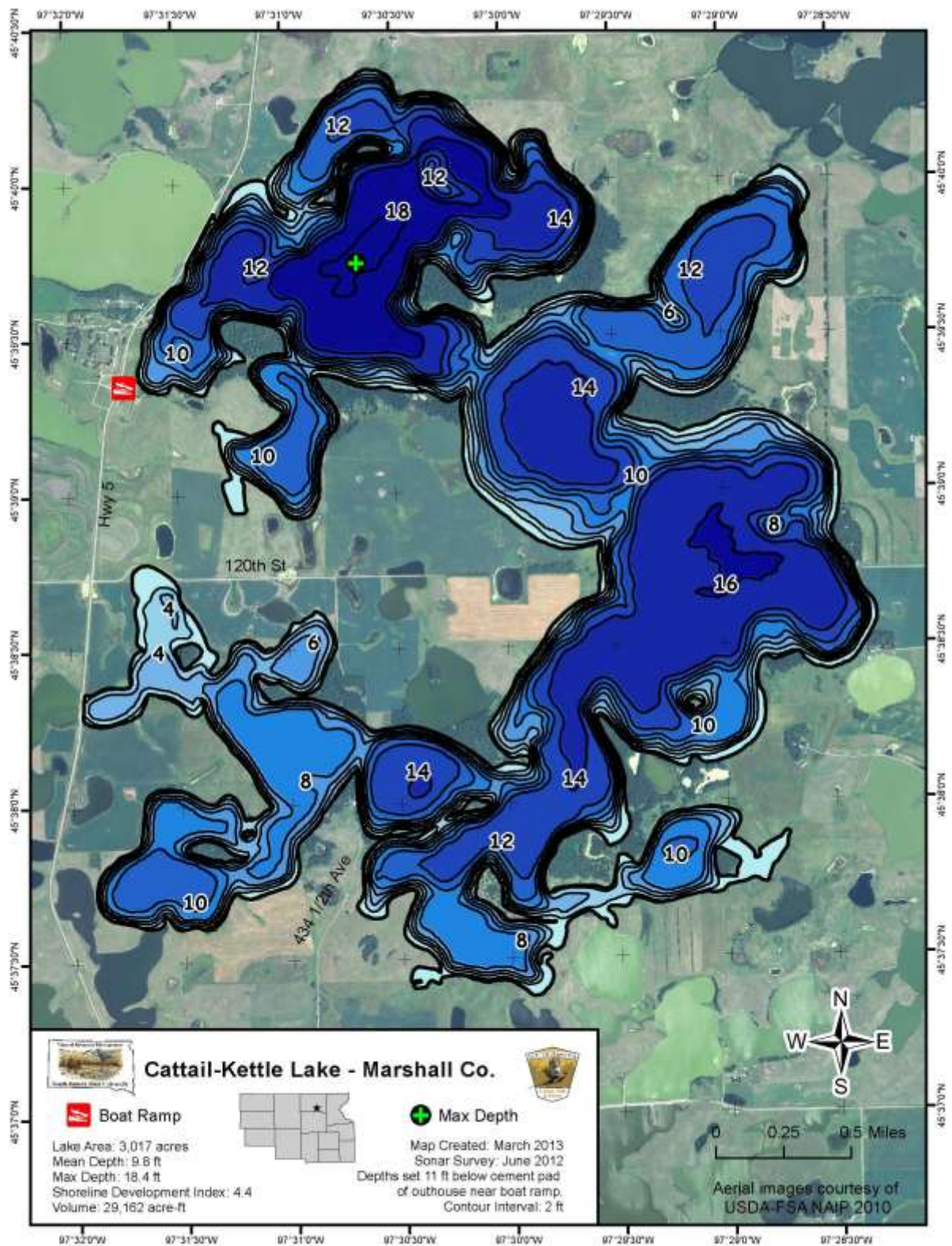


Figure 1. Map depicting depth contours of Cattail/Kettle Lake, Marshall County, South Dakota.

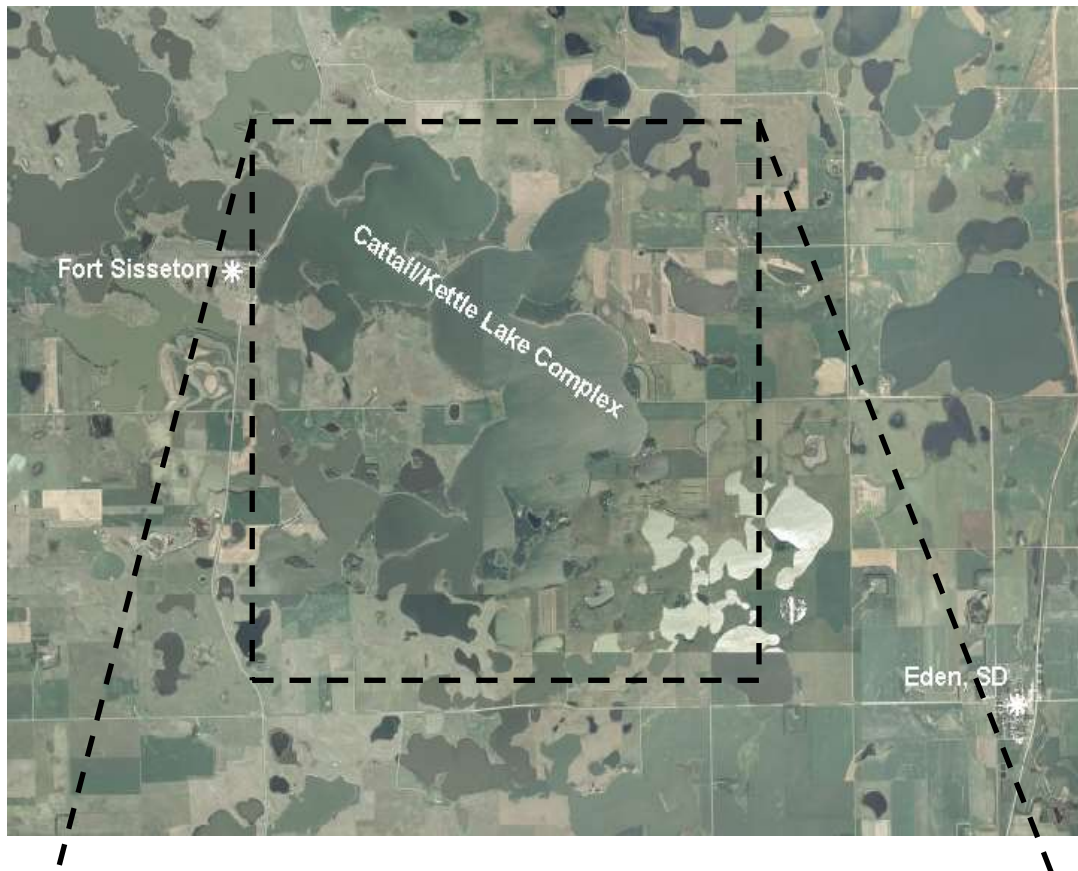


Figure 2. Map depicting location of the Cattail/Kettle Lake Complex from Eden, Marshall County, South Dakota (top). Also noted are standardized net locations and the access area which includes boat ramp, dock, and public toilet (bottom). CKFN = frame nets, CKGN= gill nets

## Management Objectives

- 1) Maintain a mean gill net CPUE of stock-length walleye  $\geq 10$ , a PSD of 30-60, and a PSD-P of 5-10.
- 2) Maintain a mean gill net CPUE of stock-length yellow perch  $\geq 30$ , a PSD of 30-60, and a PSD-P of 5-10.
- 3) Maintain a mean frame net CPUE of stock-length black bullhead  $\leq 100$ .

## Results and Discussion

Cattail/Kettle Lake is a natural lake located in Marshall County of northeastern South Dakota. High water levels during the 1990s combined Cattail and Kettle lakes along with several smaller sloughs into one large body that is now commonly referred to as Cattail/Kettle Lake. Water flows into Cattail/Kettle Lake from Lost Lake to the north and through a series of shallow lakes to the northwest. The outlet is located on the southwest corner and flows toward Hickman Dam to the west. Cattail/Kettle Lake is primarily managed as a walleye and yellow perch fishery. Overall, as many as 10 species of fish contribute to the fishery in Cattail/Kettle Lake.

### *Primary Species*

Walleye: The 2015 mean gill net CPUE for stock-length walleye of 6.3 represented an increase from the 2014 CPUE of 2.0 but remains below the minimum objective ( $\geq 10$  stock-length walleye/net night; Tables 1-3). Currently, relative abundance is moderate.

In 2015, gill net captured walleye ranged in TL from 12 to 63 cm (4.7 to 24.8 in; Figure 3). The PSD was 26 and PSD-P was 24 (Table 1). Age estimates made using otoliths revealed the presence of six year classes (2006, 2008, 2010, 2011, 2014 and 2015; Table 4). Unfortunately, from 2006-2013 recruitment was poor and each cohort was represented by only a limited number of individuals (Table 4). Natural recruitment contributes to the population (e.g., 2009); however, stronger year classes (e.g., 2006, 2011) tend to coincide with stocking events (Table 4). Since 2014, recruitment has improved with the 2014 and 2015 year classes comprising 35% and 53% (Table 4), respectively, of walleye in the 2015 gill net catch. In addition, the 2015 fall night electrofishing mean CPUE of 75.0 indicates a strong age-0 year class (Table 1).

Walleye growth is fast; the 2015 gill net weighted mean TL at capture at age-1 was 311 mm (12.2 in; Table 5). Condition was good with mean  $W_r$  values ranging from 86 to 104 for all length categories sampled (e.g., stock to quality). The mean  $W_r$  for stock-length walleye was 98 (Table 1) and no length related trend in  $W_r$  was observed.

Yellow Perch: The mean gill net CPUE of stock-length yellow perch was 28.8 (Table 1) and slightly below the minimum objective ( $\geq 30$  stock-length yellow perch/net night; Table 3). Since 2006, the mean gill net CPUE of stock-length yellow perch has fluctuated from a low of 21.5 (2006) to a high of 156.8 (2013; Table 2). Based on the 2015 gill net catch, relative abundance is moderate.

Yellow perch captured in the gill net catch ranged in TL from 9 to 24 cm (3.5 to 9.4 in), with the majority being < quality-length (20 cm; 8 in), which resulted in low PSD and PSD-P values of 5 and 0 (Table 1; Figure 4). Both the PSD and PSD-P were below management objectives of 30-60 and 5-10, respectively (Table 3).

Historically, yellow perch have exhibited consistent recruitment of varying magnitude (Table 7). However, in 2015, otoliths collected from a sub-sample of gill net captured yellow perch indicated the presence of only two consecutive year classes (2013 and 2014; Table 7). Few yellow perch  $\geq$  age 3 have been sampled from Cattail/Kettle Lake since 2009 (Table 7; Table 8).

In 2015, the weighted mean TL at capture for age-1 and age-2 yellow perch was 133 and 193 mm (5.2 and 7.6 in), respectively (Table 8). There was no length related trend in condition and mean Wr values were > 93 for all length categories (e.g., stock to quality) sampled.

### *Other Species*

Black Bullhead: Black bullheads were the most abundant fish species in the gill net catch. The mean gill net CPUE of stock-length black bullheads was 45.1 (Table 1). The 2015 gill net CPUE represented an increase from the 2014 CPUE of 2.8 (Table 2).

Frame net captured black bullheads ranged in TL from 11 to 33 cm (4.3 to 13.0 in). The PSD was 28 and the PSD-P was 2 (Table 1). No age and growth information was collected in 2015. The 2015 mean Wr for stock-length black bullhead was 103 (Table 1).

Black Crappie: Black crappie populations are typically assessed using frame nets; however, no frame nets were utilized in 2015. The gill net catch of stock-length fish in Cattail/Kettle Lake has varied substantially since 2006, ranging from 0.3 (2008 and 2013) to 30.7 (2010; Table 2). The 2015 gill net CPUE of stock-length black crappies was 26.0 (Table 1), indicating an increase in abundance. In addition, the gill net CPUE for sub-stock black crappie was 43.2. Unfortunately, recent strong year classes have not recruited well into the population. Gill net captured black crappie ranged in TL from 6 to 16 cm (2.4 to 6.3 in).

Northern Pike: Northern pike typically are not sampled effectively during mid-summer fish community surveys. As a result, mean gill net CPUE values are often low. Northern pike relative abundance in Cattail/Kettle Lake has generally been considered low to moderate, with mean gill net CPUE values that ranged from 0.0 to 1.7 from 2004-2011 (Table 2). In 2012 - 2014, relative abundance increased with mean gill net CPUE values for stock-length northern pike of  $\geq 4$  (Table 2). In 2015 the mean gill net CPUE was 1.8 (Table 1), indicated a decrease in relative abundance from high to moderate.

Gill net captured northern pike ranged in TL from 58 to 76 cm (22.8 to 29.9 in), had a PSD of 100 and PSD-P of 9 (Table 1; Figure 5). Size structure indices should be interpreted with caution as sample size was low (i.e., 11 stock-length northern pike). Although sample size was low, northern pike condition was similar to that of northern pike captured from other northeast South Dakota glacial lakes (e.g., Roy and Clear Lakes) with the mean  $W_r$  of stock-length fish being 91 (Table 1).

Other: Bluegill and white sucker were other fish species captured in low numbers during the 2015 survey (Table 1).

### **Management Recommendations**

- 1) Conduct fish community assessment surveys utilizing experimental gill nets annually (next survey scheduled in summer 2016) and utilizing frame nets every third year (next survey scheduled in summer 2017) to monitor fish relative abundance, size structure, growth and stocking success.
- 2) Conduct fall night electrofishing annually to monitor age-0 walleye relative abundance.
- 3) Stock walleye ( $\approx 500$  fry/acre) to establish additional year classes if fall night electrofishing CPUE of age-0 walleye and gill netting results warrant [i.e., low gill net CPUE of sub-stock (i.e.,  $< 25$  cm; 10 in) walleye and/or fall night electrofishing CPUE of age-0 walleye  $< 75$  fish/hour].
- 4) Collect otoliths from walleye and yellow perch to assess the age structure and growth rates of each population.
- 5) Recommend removal of the 381-mm (15 in) minimum length limit on walleye. Currently, walleye are a minimal component of the fishery and few benefits of the regulation are being realized.
- 6) Consider spring night electrofishing to assess largemouth bass population parameters; an increased presence of largemouth bass (primarily age-0) in both frame nets and gill nets has been observed in recent surveys.

Table 1. Mean catch rate (CPUE; gill/frame nets= catch/net night, electrofishing = catch/hour) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) of stock-length fish, for various fish species captured using frame nets, experimental gill nets and electrofishing from Cattail/Kettle Lake, 2015. Confidence intervals include 80 percent ( $\pm$  CI-80) or 90 percent ( $\pm$  CI-90). BLB= black bullhead; BLC= black crappie; BLG= bluegill; NOP = northern pike; WAE = walleye; WHS = white sucker; YEP = yellow perch

Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
<i>Gill nets</i>								
BLB	45.1	7.5	28	5	2	2	103	0
BLC	26.0	11.6	0	---	0	---	118	1
BLG	0.2	0.3	0	---	0	---	124	---
NOP	1.8	0.5	100	0	9	17	91	4
WAE	6.3	3.4	26	13	24	12	98	2
WHS	0.2	0.2	0	---	0	---	94	---
YEP	28.8	8.4	5	3	0	---	97	0
<i>Electrofishing</i>								
WAE <sup>1</sup>	75.0	---	---	---	---	---	---	---

<sup>1</sup>Fall Electrofishing-WAE; catch rate (CPUE) represents age-0 walleye/hour

Table 2. Historic mean catch rate (CPUE; frame/gill nets= catch/net night, electrofishing= catch/hour) of stock-length fish for various fish species captured by experimental gill nets, frame nets, and electrofishing from Cattail/Kettle Lake, 2006-2015. BLB = black bullhead; BLC= black crappie; BLG= bluegill; COC= common carp; GSF= green sunfish; LMB= largemouth bass; NOP = northern pike; SMB = smallmouth bass; WAE = walleye; WHS = white sucker; YEP = yellow perch

Species	CPUE									
	2006 <sup>1</sup>	2007 <sup>1</sup>	2008	2009	2010	2011	2012	2013	2014	2015
<i>Frame nets</i>										
BLB	15.1	2.9	0.1	0.0	0.0	0.1	4.4	20.2	23.7	---
BLC	10.3	7.1	2.5	0.4	1.9	5.5	11.9	3.2	1.9	---
BLG	0.0	0.0	1.8	0.1	0.7	1.8	2.4	13.3	23.6	---
COC	4.2	3.2	0.9	0.4	0.5	0.1	0.2	0.0	0.1	---
GSF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	---
LMB	0.1	0.0	0.1	0.1	0.0	0.0	0.2	0.0	0.0	---
NOP	0.8	0.2	1.3	0.6	0.3	0.2	0.5	0.7	0.7	---
SMB	0.8	0.0	0.8	0.2	0.7	1.3	0.6	0.7	0.5	---
WAE	3.8	2.3	2.0	1.2	0.3	0.1	0.5	0.3	0.1	---
WHS	0.8	0.1	0.2	0.1	0.1	0.1	0.3	0.0	0.0	---
YEP	2.7	1.9	3.2	5.6	18.7	19.0	21.2	26.1	36.7	---
<i>Gill nets</i>										
BLB	38.0	2.8	0.0	0.0	0.0	0.0	2.3	4.2	2.8	45.1
BLC	9.7	4.7	0.3	0.7	30.7	8.3	12.3	2.5	0.3	26.0
BLG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.2
COC	2.5	8.5	2.0	1.5	0.3	0.3	0.0	0.0	0.2	0.0
NOP	0.0	1.7	1.3	0.8	0.3	0.7	4.0	5.0	4.0	1.8
SMB	0.0	0.0	0.0	0.3	3.7	0.3	0.0	0.2	0.2	0.0
WAE	10.8	15.0	5.3	6.7	8.5	7.5	2.8	3.7	2.0	6.3
WHS	0.2	0.2	0.2	0.3	0.5	0.5	1.3	2.5	0.7	0.2
YEP	21.5	72.5	58.7	83.0	140.2	92.2	152.0	156.8	67.2	28.8
<i>Electrofishing</i>										
WAE <sup>2</sup>	---	---	295.1	---	0.0	87.0	---	---	2.0	75.0

<sup>1</sup> Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

<sup>2</sup> Fall Electrofishing-WAE; catch rate (CPUE) represents age-0 Walleye/hour

Table 3. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) for selected species captured in frame nets and experimental gill nets from Cattail/Kettle Lake, 2006-2015. BLB= black bullhead; BLC= black crappie; BLG= bluegill; NOP= northern pike; WAE= walleye; YEP= yellow perch

Species	2006 <sup>1</sup>	2007 <sup>1</sup>	2008	2009	2010	2011	2012	2013	2014	2015	Objective
<i>Frame nets</i>											
BLB											
CPUE	15	3	<1	0	0	<1	4	20	3	---	≤ 100
PSD	53	71	100	---	---	50	29	5	24	---	---
RSD-P	39	6	100	---	---	0	0	4	6	---	---
Wr	95	91	85	---	---	88	91	86	99	---	---
BLC											
CPUE	10	7	3	<1	2	6	12	3	2	---	---
PSD	4	84	78	57	31	4	4	9	3	---	---
RSD-P	0	9	64	57	31	2	0	2	0	---	---
Wr	112	111	111	112	115	113	117	120	115	---	---
BLG											
CPUE	0	0	2	<1	1	2	2	13	24	---	---
PSD	---	---	0	0	0	0	5	2	0	---	---
RSD-P	---	---	0	0	0	0	0	0	0	---	---
Wr	---	---	89	135	110	102	111	98	107	---	---
<i>Gill nets</i>											
WAE											
CPUE	11	15	5	7	9	8	3	4	2	6	≥ 10
PSD	95	53	16	90	67	80	65	73	83	26	30-60
RSD-P	18	27	9	3	12	20	18	36	50	24	5 – 10
Wr	97	89	87	88	96	96	94	89	93	98	---
YEP											
CPUE	22	73	59	83	140	92	152	157	67	29	≥ 30
PSD	72	24	26	3	10	16	10	3	5	5	30-60
RSD-P	17	6	2	0	0	1	2	0	0	0	5-10
Wr	98	103	107	105	102	95	95	97	96	97	---

<sup>1</sup> Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

Table 4. Year class distribution based on the expanded age/length summary for walleye sampled in gill nets and associated stocking history (# stocked x 1000) from Cattail/Kettle Lake, 2011-2015.

Survey Year	Year Class													
	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
2015	46	30			4	1		1		4				
2014	---	3	1	1	4		1			5				
2013 <sup>1</sup>	---	---	15	1	9	4	2	1		3				
2012	---	---	---		6	4		6		1				
2011 <sup>1</sup>	---	---	---	---	85	8	4	21		9	1			
# stocked														
fry			1350		1400	1350		4000		2700				
sm. fingerling	270												300	
lg fingerling		5												

<sup>1</sup> Older walleye were sampled, but are not reported in this table

Table 5. Weighted mean TL at capture (mm) for walleye age-0 through age-10 captured in experimental gill nets (expanded sample size) from Cattail/Kettle Lake, 2006-2015. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

Year	Age										
	0	1	2	3	4	5	6	7	8	9	10
2015	136(46)	311(30)	---	---	517(4)	516(1)	---	632(1)	---	558(4)	---
2014	168(3)	307(1)	331(1)	467(4)	---	523(1)	---	---	566(5)	---	---
2013 <sup>1</sup>	128(15)	309(1)	377(9)	492(4)	567(2)	555(1)	---	559(3)	---	---	---
2012	---	301(6)	440(4)	---	494(6)	---	546(1)	---	---	---	---
2011 <sup>1</sup>	143(85)	322(8)	407(4)	452(21)	---	517(9)	549(1)	---	---	---	---
2010 <sup>1</sup>	168(6)	299(6)	372(20)	---	482(22)	---	---	608(1)	---	---	---
2009 <sup>1</sup>	135(13)	242(11)	---	411(35)	438(1)	---	---	---	---	---	---
2008 <sup>1</sup>	124(29)	257(2)	323(26)	---	---	473(1)	---	---	---	635(1)	---
2007	---	256(62)	403(10)	444(7)	479(5)	570(1)	499(2)	553(3)	558(7)	---	590(13)
2006	183(15)	199(2)	326(3)	429(49)	522(1)	507(1)	563(1)	568(4)	554(4)	643(1)	543(1)

<sup>1</sup> Older Walleye were sampled, but are not reported in this table.

Table 6. Stocking history including size and number for fishes stocked into Cattail/Kettle Lake, 2002-2015. WAE= walleye

Year	Species	Size	Number
2003	WAE	small fingerling	300,290
2006	WAE	fry	2,700,000
2008	WAE	fry	4,000,000
2010	WAE	fry	1,350,000
2011	WAE	fry	1,400,000
2013	WAE	fry	1,350,000
2014	WAE	large fingerling	5,165
2015	WAE	small fingerling	270,120

Table 7. Year class distribution based on expanded age/length summary for yellow perch sampled in gill nets from Cattail/Kettle Lake, 2011-2015.

Survey Year	Year Class							
	2015	2014	2013	2012	2011	2010	2009	2008
2015		227	31					
2014	---	84	462	23	10			
2013	---	---	78	756	624			
2012	---	---	---		2573	187	14	
2011	---	---	---	---	11	453	108	4

Table 8. Weighted mean TL (mm) at capture for yellow perch captured in experimental gill nets (expanded sample size) from Cattail/Kettle Lake, 2009-2015.

Year	Age			
	0	1	2	3
2015	---	133(227)	193(31)	---
2014	94(84)	144(462)	197(23)	212(10)
2013	99(78)	130(756)	169(624)	---
2012	---	121(2573)	195(187)	254(14)
2011	89(11)	163(453)	212(108)	271(4)
2010	94(463)	159(710)	210(131)	---
2009	89(9)	157(488)	227(17)	285(1)

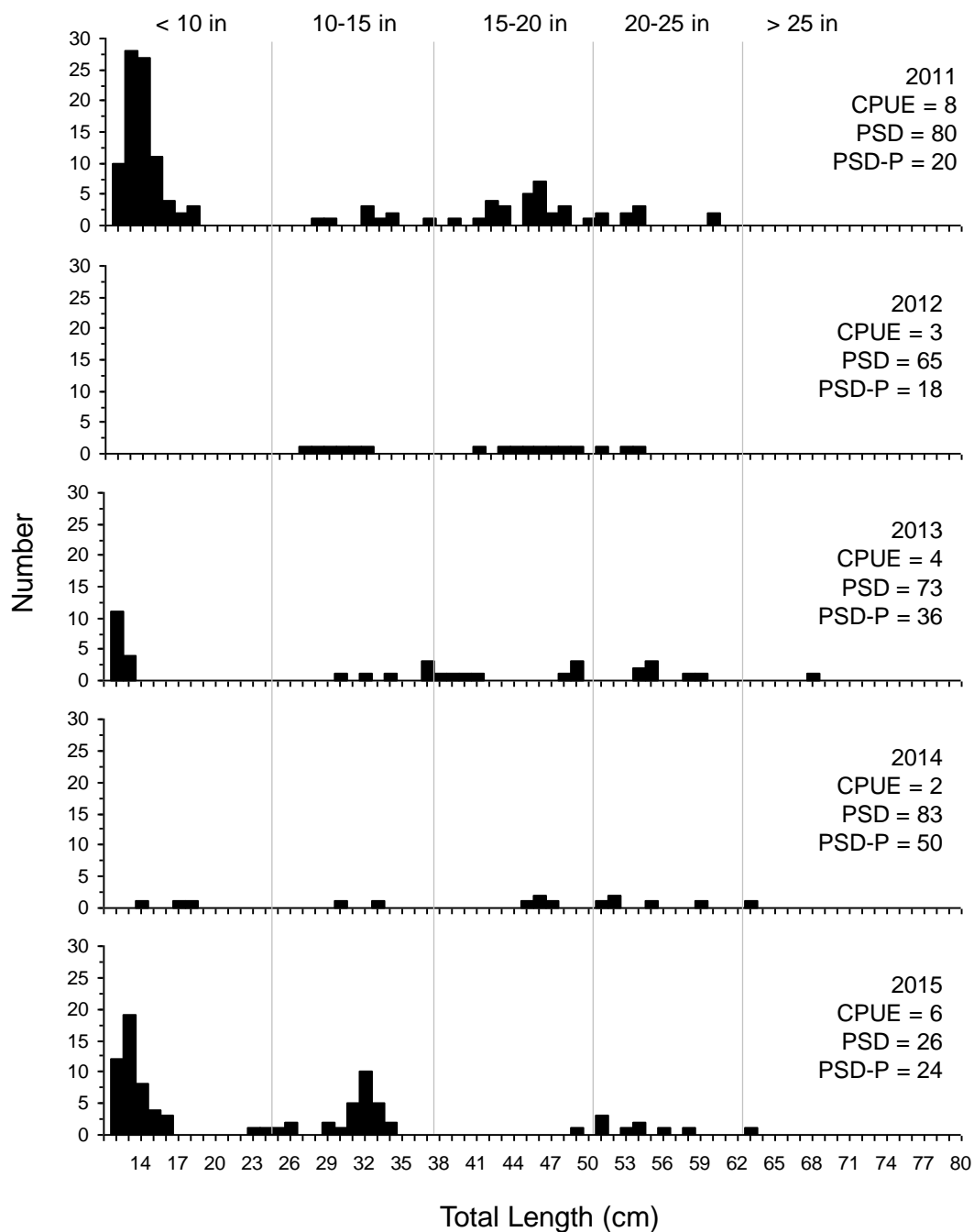


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Cattail/Kettle Lake, 2011-2015.

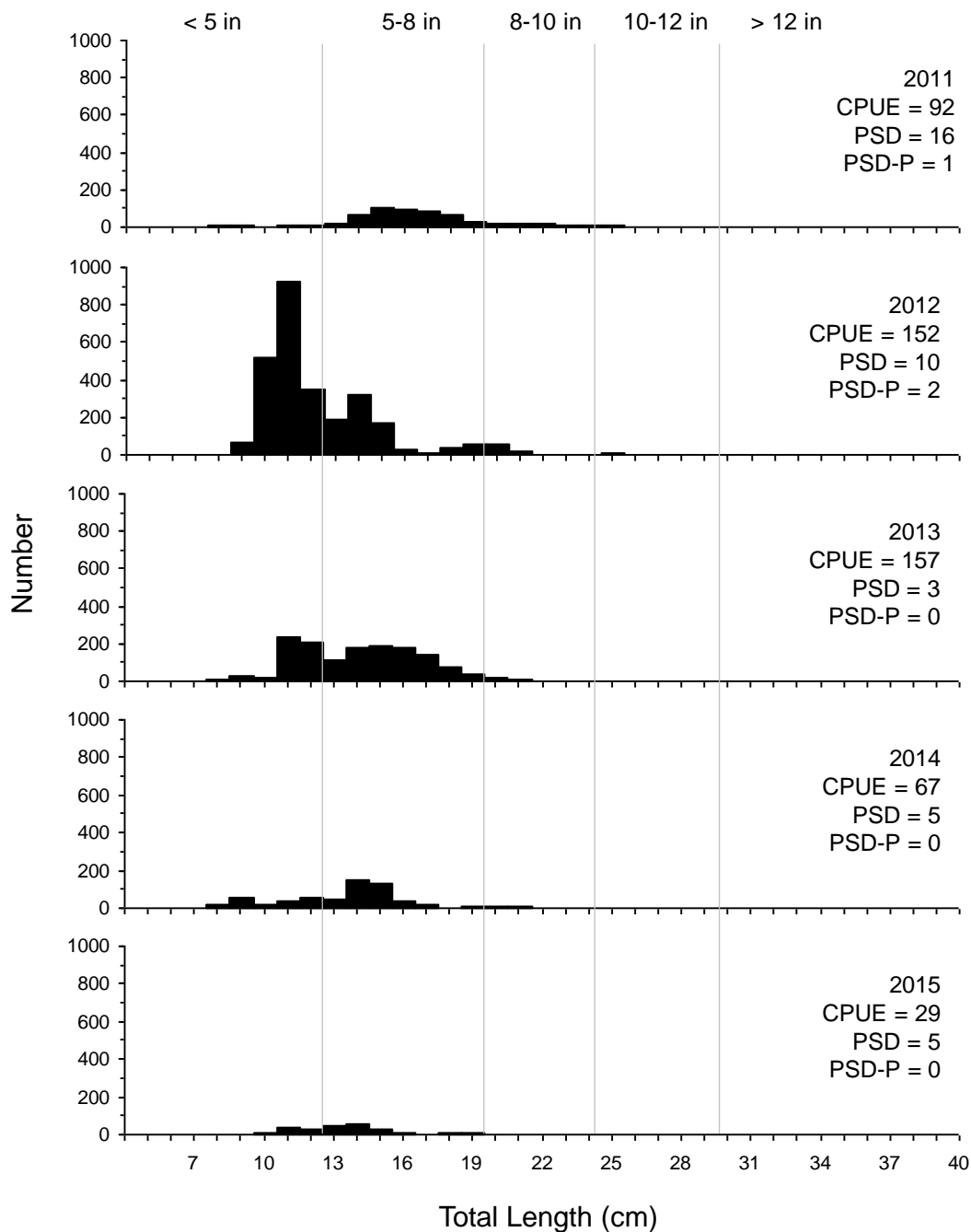


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Cattail-Kettle Lake, 2011-2015.

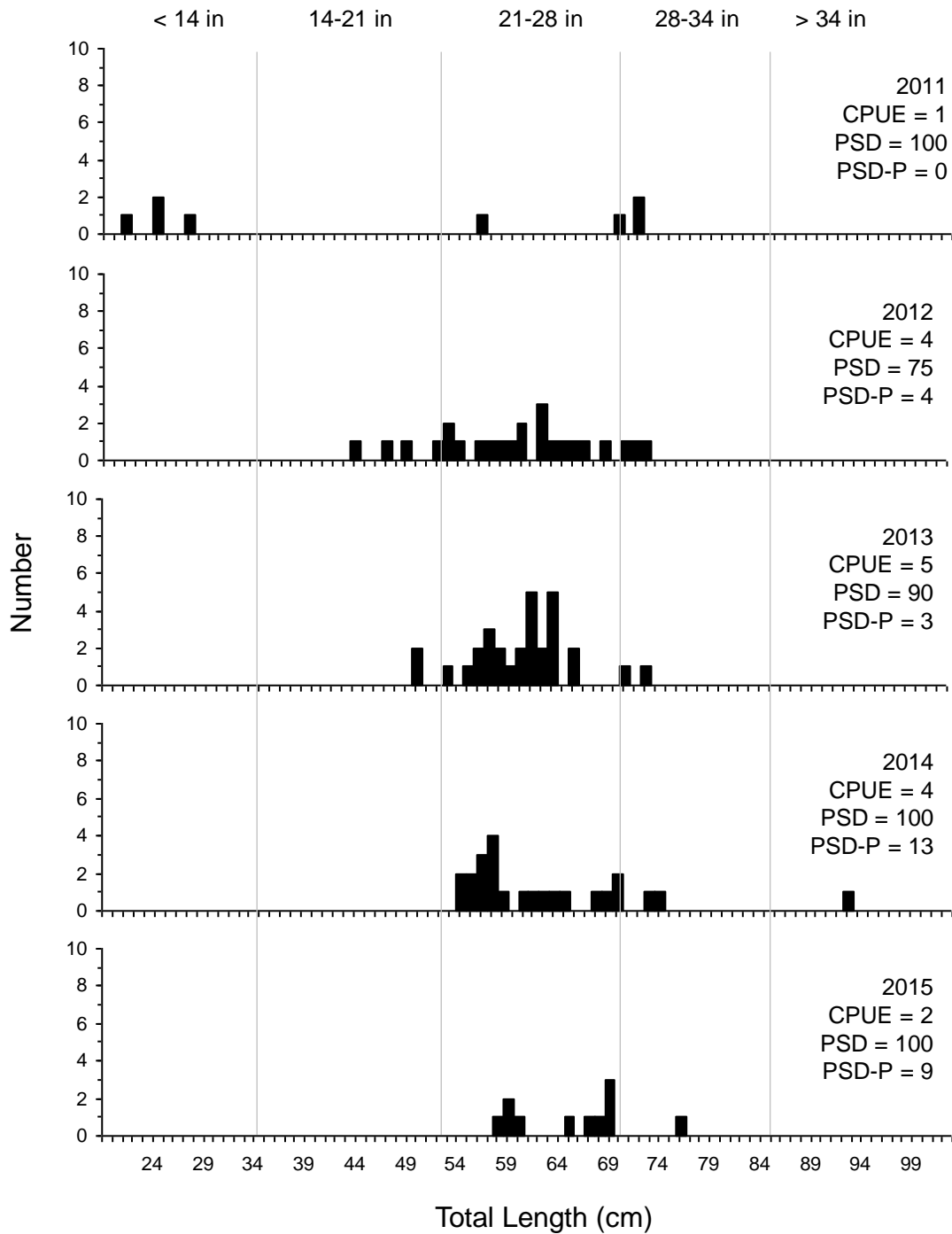


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for northern pike captured using gill nets in Cattail-Kettle Lake, 2011-2015.